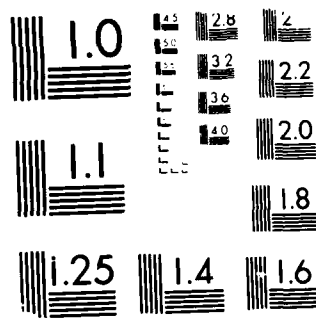


AD-A190 534 MEASUREMENT OF ATMOSPHERIC TRANSMISSION OVER LONG PATHS 1/1
IN THE INFRARED S. (U) TECHNION - ISRAEL INST OF TECH
HAIFA DEPT OF PHYSICS U P OPPENHEIM ET AL. 30 NOV 86
UNCLASSIFIED AFOSR-TR-87-1786 AFOSR-83-0023 F/G 4/1 ML

END

DATE

4 8 8 6



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

(2)

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION

UNCLASSIFIED

1b. RESTRICTIVE MARKINGS

DTIC FILE COPY

AD-A190 534 SCHEDULE

3. DISTRIBUTION / AVAILABILITY OF REPORT
Approved for public release;
Distribution Unlimited

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

AFOSR-TR- 87-1786

6a. NAME OF PERFORMING ORGANIZATION

6b. OFFICE SYMBOL
(If applicable)

7a. NAME OF MONITORING ORGANIZATION

AFOSR/NC

6c. ADDRESS (City, State, and ZIP Code)

Technion R&D Foundation

7b. ADDRESS (City, State, and ZIP Code)

Building 410
Bolling AFB, Washington D.C. 203328a. NAME OF FUNDING / SPONSORING
ORGANIZATION

AFOSR

8b. OFFICE SYMBOL
(If applicable)

NC

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

AFOSR-83-0023

8c. ADDRESS (City, State, and ZIP Code)

Bldg 410
Bolling AFB DC 20332-6448

10. SOURCE OF FUNDING NUMBERS

PROGRAM
ELEMENT NO.
61102FPROJECT
NO.
2310TASK
NO.
A1WORK UNIT
ACCESSION NO.

11. TITLE (Include Security Classification)

Measurement of Atmospheric Transmission Over Long Paths in the Infrared
Spectral Region

12. PERSONAL AUTHOR(S)

U.P. Oppenheim and S.G. Lipson

13a. TYPE OF REPORT

Final Scientific

13b. TIME COVERED

FROM Apr. 85 TO Nov. 86

14. DATE OF REPORT (Year, Month, Day)

1986, Nov. 30

15. PAGE COUNT

6

16. SUPPLEMENTARY NOTATION

Apr. 85 Nov. 86

17. COSATI CODES

| FIELD | GROUP | SUB-GROUP |
|-------|-------|-----------|
| | | |
| | | |
| | | |

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

Infrared, atmosphere, transmission, spectrum

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Atmospheric transmission over a 10.37 km and a 38.9 km path is reported as a function of wavelength in the 3-5 micron region of the spectrum. High relative humidity conditions prevailed and good signal to noise was achieved with a spectral resolution of 2%.

DTIC
ELECTE
S JAN 12 1988 D
& E

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT

☒ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION

Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL

Lt Col James P Koermer, USAF

22b. TELEPHONE (Include Area Code)

(202) 767-4960

22c. OFFICE SYMBOL

NC

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted.

All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

87 12 00 270

4 NOV 1986

Grant AFOSR-83-0023

AFOSR-TR. 87-1786

Final Scientific Report

MEASUREMENT OF ATMOSPHERIC TRANSMISSION OVER LONG PATHS
IN THE INFRARED SPECTRAL REGION

by

U.P. Oppenheim
S.G. Lipson

Department of Physics
Technion - Israel Institute of Technology
Haifa 32000, Israel

| | |
|--------------------|--|
| Accession For | |
| NTIS GRA&I | <input checked="checked" type="checkbox"/> |
| DTIC TAB | <input type="checkbox"/> |
| Unannounced | <input type="checkbox"/> |
| Justification | |
| By _____ | |
| Distribution/ | |
| Availability Codes | |
| Dist | Avail and/or Special |
| A-1 | |

23 October, 1987

Final Scientific Report, April 1985 - 30 November 1986

This research is being conducted at Technion Research and Development Foundation Ltd. under Grant No. AFOSR-83-0023 sponsored by the Air Force Office of Scientific Research, United States Air Force.

All rights reserved by Technion R&D Foundation.

Prepared for European Office of Aerospace Research and Development,
London, England.

Approved for Release by NSA on 09-11-2013 pursuant to E.O. 13526

INTRODUCTION

The period covered in this report is from 1 April 1985 to 30 September 1986. Originally the Grant period was for one year only ending on 31 March 1986, but later a no-cost extension was made, extending the Grant period to 30 Sept. 1986.

WORK DONE DURING GRANT PERIOD

The work was carried out in two parts. During the first part a re-evaluation of the previous Palmachim experiment was carried out at the request of Dr. R.W. Fenn (Air Force Geophysics Laboratory). The result was a new presentation of the measurements of atmospheric transmittance in the 3-5 and 8-14 micron regions. These results were submitted directly to Dr. Fenn on January 28, 1986.

The second part of the work was a field experiment done in the Northern part of Israel in February, 1986. Two optical paths were measured: one was between Har Odem and Har Avital, and the other was between Har Odem and Har Meron. The first path was 10.37 km long and the second was 38.9 km long. Due to an unfortunate experimental problem the 8-14 micron detector became defective during the experiment and as a result only the 3-5 micron region was measured.

The results were compared with LOWTRAN6 calculations and presented in an easily readable format. Figures showing the results were also produced, an example of which is shown in the accompanying figure. All results were sent directly to Dr. R.W. Fenn at Air Force Geophysics Laboratory on July 13, 1986.

The measurements were made with a spectral resolution of 2% (H.W.H.M.). The air temperature, relative humidity and pressure were measured at the two ends of the optical path and properly averaged to represent the integrated water vapor content of the path, its air temperature and pressure. The visibility was estimated, as accurately as possible, by a trained observer. In all the calculations a rural aerosol model was assumed.

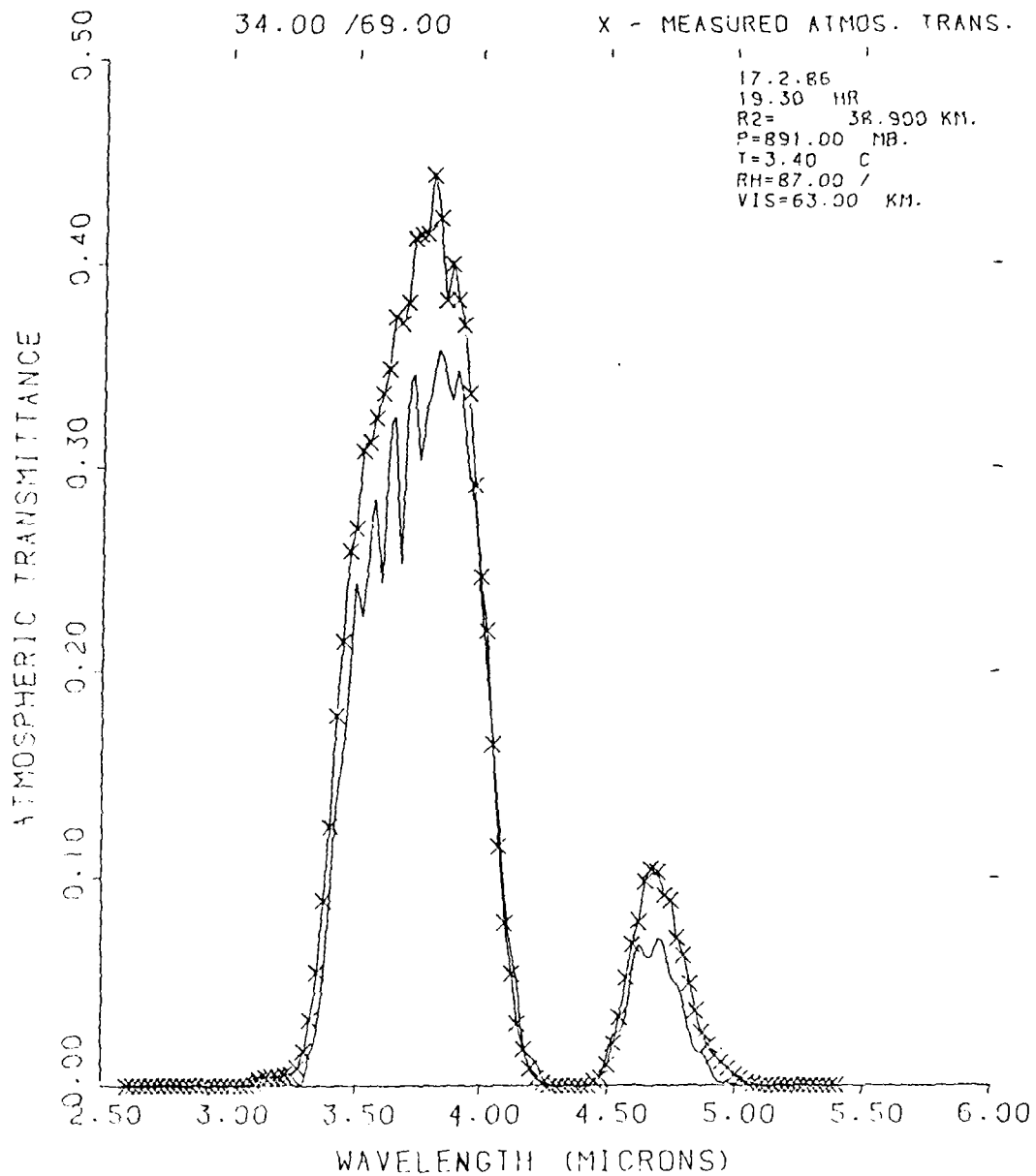
In order to make comparisons between theory and experiment more meaningful the output of the LOWTRAN 6 calculations was convolved with a triangular slit function with a 2% band width (H.W.H.M.).

The accompanying figure will now be described as an example of the results obtained. The top of the figure carries the legend 34.00/69.00. The number 34.00 is the serial number of the spectrum and the number 69.00 is ^a constant which may be disregarded. The figure itself contains two curves: the experimental curve, denoted by crosses, and the theoretical curve, calculated according to LOWTRAN 6. The upper right hand corner carries the following entries:

| <u>Entry</u> | <u>Explanation of Entry</u> |
|----------------|---|
| 17.2.86 | Date of the experiment |
| 19.30 HR | Ignore this entry |
| R2 = 38.900 km | Optical path length in km |
| P = 891.00 MB | Total atmospheric pressure in millibars |
| T = 3.40 C | Temperature in degrees C |
| RH = 87.001 | Relative humidity in percent |
| VIS = 63.00 km | Visual range (human observer) |

It is seen that the measured atmospheric transmittance, indicated

by crosses, is higher than the theoretical curve (without crosses) by several percent. This result was observed in almost all of the spectra obtained in this experiment.



DATE
FILMED
4 8